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ABSTRACT

Several aspects of unplanned system change in schools are investigated in this paper. Researchers relied heavily on current theoretical perspectives on the nature of educational systems, particularly those that emphasize the "loosely coupled" nature of educational organizations. Two hypotheses were tested. The first is that natural system change over a short period of time will exhibit characteristics of loose linkage and that change in one system characteristic will not be significantly associated with changes in other system characteristics. The second was that there will be negative relationships between the level of system change and the level of implementation of planned program change. The research was based on a secondary analysis of data previously collected to examine a planned change program. Teachers in 45 schools located in 10 rural school districts completed questionnaires, and onsite ethnographers collected structured data about program implementation. Analysis revealed no evidence to suggest that changes in one part of the system reverberate throughout the system, but patterns of association among some parts were apparent. The data also indicated that it is reasonable to expect either changes in the characteristics of the organization or in the technology of the organization but to attempt both types simultaneously is unrealistic. (Author/JM)

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SYSTEM CHANGE, SYSTEM LINKAGE AND PROGRAM IMPLEMENTATION

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Introduction

The topic of educational change has received considerable attention from both researchers, policymakers and practitioners over the past few years, and interest in this topic does not appear to be abating.

Most empirical studies of educational change are concerned with planned innovation, which may be of two types. In the vast majority of cases, the investigations of planned innovation are focused on the adoption of new curricula, materials, or teaching techniques, i.e., change in the technology of the school (Gross et al., 1971; Berman and McLaughlin, 1977; Baldridge and Burnham, 1975; and Rosenblum and Louis, 1978). To a more limited extent, schools are beginning to examine the benefits of planned system change, more frequently known as organizational development (see, for example, Schmuck et al., 1969; Education and Urban Society, 1976; and Keys and Bartunek, 1979). In most studies of planned change, an object of change is identified, a program of change activities is designed to achieve specific, known objectives, and there is a high level of awareness among the system's members of the change effort. Such studies are primarily concerned with describing the intervention and explaining its intended or unintended outcomes.

In contrast, fewer studies have examined changes in educational systems at the school or district level that are not clearly a consequence of directed, purposive, planned change activities.* Most of these investigations are case studies, which cover particular important historical periods or organizational crises (Stinchcomb, 196 ; Katz, 1971). Only a few studies of change or adaptation across multiple sties have been conducted, and these are often narrowly focused on a particular aspect of the system, such as the role of the Superintendent (Carlson, 1962) or the use of team teaching (Cohen et al., 1979).

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*There exists a small, but more systematic literature on educational change at the regional or national level. See, for example, Harriott and Hodgkins (1973) or Milstein (1977). In addition, NIE is planning a major longitudinal study of high school system characteristics (Abramowitz and Tennenbaum, 1978).

A topic that is even less well researched, however, is the interface between planned change and changes in the characteristics of the systems in which they are embedded. Many ethnographic reports of planned change programs indicate ways in which system changes either facilitated or impeded the objectives of planned change (Wacaster, 1977; Colfer and Colfer, 1977). For example, the departure of a supportive administrator from a school or district may cause a planned change program to grind to a half (Burns, 1978). For the most part, however, the relationship between natural system change and planned change has been viewed primarily as a source of "error" in the planned change effort (March and Olsen, 1976; Pondy and Mitroff, 1979).

The objective of this paper is to investigate several aspects of unplanned system change in schools that were also engaging in a major planned change effort which were directed toward educational technology. In this examination we rely heavily on current theoretical perspectives on the nature of educational systems, particularly those that emphasize the "loosely coupled" nature of educational organizations.

Systems and Change: System Linkage

The systems framework assumes that change in any part of the system will have an impact that reverberates throughout the system. To take an example from recent organization theory, Hackman and Lawler (1971) assume that if a manufacturing plant initiates a job-redesign program, the new structures will affect the culture (morale) of the workplace, the ability of the plant to determine input (recruit workers and reduce absenteeism), and the quality of the product (output). The assumption of a tight interrelationship among system variables has been seriously questioned in recent years (Bidwell, 1965; Deal and Cellotti, n.d.; Deal et al., 1975; Weick, 1976; Corwin, 1977; and Meyer and Rowen, 1977). These authors have pointed out that systems are not always so tightly coupled. Rather, organizational subsystems are likely to vary in the degree to which they are intimately linked.

Such is clearly the case with the typical American school district. The educational system is composed of classrooms, which are bound together

in higher-level organizational units (schools). Schools themselves are grouped into school districts, school districts into state educational systems, and state educational systems into regional accrediting agencies and into a national educational system. Due to long-standing traditions of local and professional autonomy, linkages become much looser as one moves from the level of the classroom upward. At the national level, for example, the "educational system" is largely informal and voluntaristic.

The degree of linkage has an important effect on the extent to which change in one part of the system will cause change in another. Thus, for example, if we examine the state level, we know that changes that take place within some districts generally have no immediate impact upon other districts in the state and frequently have no long-range impact either. Within schools, on the other hand, a change in educational programs in the third grade can have a rapid and noticeable impact on the fourth grade. As the fourth grade teacher receives incoming students who have a different background and level of preparation, she must adapt her own curriculum.

Deal et al. (1975) have noted that the "double segmentation" of schools within districts and classrooms within schools has led to situations where the variables associated with change at each level do not appear to be rationally intergrated. In fact, others familiar with school systems have noted that one of their basic characteristics is the high degree of functional autonomy of parts such that even upheavals in the administrative central office may have little impact at lower levels in the system (Lortie, 1975). In some cases, there may be deliberate attempts to insulate parts of the organization from undue influence either from other internal units or levels, or from the environment (Thompson, 1969).*

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*School systems are often categorically described as being structurally loose. (See, for example, Meyer and Rowan, 1977.) We differ from this perspective in two ways. While agreeing that schools fail, in general, to conform to an ideal Weberian model of bureaucratic behavior, we do not necessarily assume that they are any more deviant (or loose) than other organizations of similar complexity. Rather, we agree with Corwin (1977) when he wonders why anyone ever really thought that organizations behaved according to an ideal type. Second, we assume that even if schools are, in fact, less tightly linked than other types of organizational systems, considerable variation exists both among schools and among districts in the degree of system

The emergence of the loose coupling or system linkage approach should not be seen as a contradiction of previous systems theory. Rather, it is best viewed as an important extension of existing approaches to the analysis of organizational behavior from an open systems perspective. Emphasizing variability in system linkage or interdependence of parts makes existing organizational theories much more congruent with observed organizational behavior.

Although the construct of system linkage has theoretical antecedents (Corwin,), its value has to a large extent been ignored until recently. There have been many references in past literature to functional aspects of autonomy or rule evasion (Gouldner, 1959; Blau, 1972; Corwin, 1965; and Anderson, 1966), but the predominant orientation has been to view these characteristics of systems as "problems" that need to be overcome, either through the institution of close structural controls or through the development of greater participation and, presumably, stronger normative acceptance of organizational goals and procedures (see, for example, Thompson, 1969 or Barnard, 1938). The recent emphasis on loose linkage is, on the other hand, associated with a strong conviction that it may not be bad for organizational health, and may in fact have some benefits. Weick (1976), for example, identifies a number of aspects of "loose coupling" that may support planned or program change:

1) Loose coupling facilitates organizational survival by fostering stability. If organizations were required to respond to small changes in the environment on a regular basis, their energy for other productive activities would be lowered;

2) Loose coupling may facilitate organizational information gathering or "sensing" because different parts are all potentially able to respond to the same inputs (or feedback);

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linkage and the emphasis that is placed upon it. Thus it makes perfect sense to examine the impact of linkage even within a category or organizations that is more loosely linked than others. Indeed, it can do much to illuminate the problems of system linkage in general.

3) Adaptation or innovation may be facilitated in such systems. The possibility of innovation without disturbing the whole system allows the system to be more adventurous (or less restrictive) and the probability of innovations emerging is therefore higher;

4) Loose coupling facilitates local adaptation to unique problems and does not require standardized procedures;

5) System breakdowns or crisis can be isolated so that deterioration of the entire system is prevented;

6) There is more room for self-determination of parts, an aspect which is consistent with contemporary value systems (and some psychological theories which see a sense of personal efficacy as a cause of better mental health); and

7) Loose linkages make a system inexpensive to run, since they diminish the resources necessary for coordinating administration, conflict resolutions, and so forth.

Each of these functional characteristics of the more loosely linked system has its dysfunctional converse, also noted by Weick. However, on balance, the tendency of theorists of this persuasion is to look for evidence that highly controlling, tightly coordinated bureaucratic models are not necessarily more effective in many settings, particularly settings where adaptation and change are important. If the assumptions underlying Weick's arguments are examined, it appears that the basic way in which loose coupling supports change is by creating system stability. Thus, system stability is seen as a necessary component for change.

Hypotheses

Based on the above discussion of system characteristics and change, and the objective described in our introduction, two hypotheses were developed:

1) Natural system change over a short period of time will exhibit characteristics of loose linkage. Change in one system characteristic will not be significantly associated with changes in other system characteristics;

2) There will be negative relationships between the level of system change and the level of implementation of planned program change.

The Research Setting

This paper is based upon a secondary analysis of data collected to examine the impacts of a planned change program (Rosenblum and Louis, 1978). The organizational "subjects" of the original study were 45 schools located in ten rural school districts. The ten districts were participants in the Experimental Schools (ES) Program funded by the National Institute of Education (NIE). Under the auspices of NIE, these small school districts (eight of which had six schools or fewer) undertook the planning and implementation of "comprehensive" district-wide change. Each district's project was developed at the local level, but was required to reflect the federally defined objective of comprehensiveness. Many of the activities aimed at individualizing instruction, curriculum revision, and increased exposure to career opportunities, the environment andthe arts. While NIE's objectives emphasized system change, the actual planned activities can be classified as changes in technology.*

The school districts themselves represent a wide geographical and organizational spectrum of rural schools. Situated in diverse parts of the country from New England to Alaska, some schools were located on centralized campuses, while others were in recently consolidated districts which maintained small schools at considerable distances from one another.

Research Strategies

Data Sources: In the fall of 1973, at the end of the project's planning year, and in successive years through 1978 all teachers in each district were administered a mailed questionnaire which covered a wide variety of issues regarding the operations and characteristics of their school and district, and personal demographic information. In addition, information about the school system and the operations of the planned

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*Several of the school districts planned activities or programs that had some potential for system impact. Based on the federal mandate for comprehensive change, program efforts were developed to increase community participation in the educational system. However, our data indicate that these efforts were extremely limited both in intent and actual implementation. For more detail on the nature of the planned program changes, see Rosenblum and Louis, 1978.

change program was provided by anthropologists and sociologists who lived in the target districts during the program.

The following analysis is based upon survey data obtained in 1973 and 1977, and structured data about program implementation obtained from the on-site ethnographers in 1976. In the case of the survey data, teacher responses within a school were averaged to obtain a school score for each variable. Thus, the variables (discussed below) represent the organizational characteristics of the school as perceived by or represented by teachers.

Variables and Measures: Three general types of school system characteristics were measured: structural characteristics, culture or climate characteristics, and staff characteristics. These variables, their operational definitions, and their internal reliabilities are presented in Figure 1.**

The structure variables were selected on the basis of a growing consensus concerning the dimensions of the formal organization (Blau and Schoenherr, 1971; Hage and Aiken, 1970; Pugh et al., 1968). Structure variables include formalization, use of individualized technologies, several variables dealing with the power structure, and classroom autonomy. (Size, complexity, and level, while central to the notion of structure, were relatively constant over the course of the study and were not included in the analyses of system change.)

In general, the literature is in agreement that two sets of culture or climate variables are extremely important in determining organizational process. These are the morale of the staff and the cohesiveness of staff as a work group. Since there are no "work groups" as such in schools, we have redefined the latter variable as the level of collegiality among the

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**Individuals who are interested in the actual indicators used for each variable may contact the authors for a copy of the instrument.

Figure 1

School Structure Variables

Variable	Operational Definition/ Measures Used	Chronbach's Alpha Coefficient of Internal Reliability
Structure Variables		
Formalization	Number of formal policies that are regularly enforced	.77
Individualized Instruction	Use of individualized instruction	.82
Classroom Autonomy	Number of classroom decisions that the teacher can make on his or her own	.72
School Board Influence	Amount of influence over 13 educational decisions	.83
Superintendent Influence	Amount of influence over 13 educational decisions	.85
Principal Influence	Amount of influence over 13 educational decisions	.84
Teacher Influence	Amount of influence over 13 educational decisions	.75
Culture Variables		
Tension Index	Number of role pairs that have at least "some" tension	.82
Disputes Index	Number of issues that cause frequent disputes between various groups	.87
Morale	Discrepancy between actual and desired level of personal influence	.86
Change Orientation	Additive score on 6 change attitude items	.71
Orientation to Pupil Autonomy Index	Additive score on 7 pupil autonomy attitude items	.77
Collegiality Index	Additive score on 6 collegiality items	.69
Perception of Problems Index	Number of areas perceived as moderate or serious problems in the school	.71
Goal Differentiation	Number of goals considered to be "very important"	.74
Goal Discrepancy Index	The sum of the difference between the importance of goals and how well they are being accomplished (12 goals)	.77
Staff Variables		
Teaching experience	Mean number of years of teacher experience	*
Number of professional books read in past year	Mean number of books reported read by respondents	*
Staff modernity (cosmopolitanness)	Mean modernity of states in which respondents have worked as educators**	*
Educational Level	Percentage of staff with more than a Bachelor's degree	*
Father's Educational Level	Percentage of staff who have fathers with some college education	*
Percent Male	Percentage of staff who are male	*

*Staff characteristic variables are individual items. Reliability coefficients were not, therefore, calculated.

**Modernity of school district experience scores were computed by assigning a state modernity score (see Herriott and Hodgkins, 1973, Table 4-2) to each school district that a staff member had worked in, averaging those scores for each respondent after weighting them by the number of years of experience in each district, and then computing the mean for the school as a whole by averaging staff scores.

staff. However, other variables also seemed important in defining the normative character of the schools. The list that was finally developed represents a potpourii of factors that we believed to be important in schools. These were selected on the basis of available theoretical discussions, case studies and quantitative studies, not all of which were directly concerned with change. Among these are the level of tension between various groups, the actual disputes that occurred over school-related issues, the orientation toward change of the staff as a whole, the orientation to pupil autonomy in the educational process, the staff's perception of problems within their school, and the degree to which the staff perceived a discrepancy between their goals and the achievement of goals.

While studies of educational outcomes have had little success in finding correlations between staff characteristics and student achievement, the characteristics of individuals have often been found to be associated with innovative behavior (see, for example, Rogers and Shoemaker, 1971).

In considering the staff characteristics that are likely to be associated with organizational innovation, two different categories of variables should be included. First, there are variables that reflect the professional experience and behavior of the staff members, such as teaching experience, professional reading, and experience in more "modern" social contexts (Herriott and Hodgkins, 1973).

In addition, personal characteristics may also be important. Diffusion research indicates that innovations are likely to be adopted by individuals who are of high status, and who are highly educated (Rogers and Shoemaker, 1971). In addition to the variables of status (measured by father's educational level), and educational level, we also included a variable measuring the percentage of male teachers in the school.

A final set of variables that are part of our analysis are indicators of planned change. The variable, the "scope of implementation," was designed to measure the degree to which the school had implemented comprehensive changes by the end of the fourth year of the program. An important characteristic of the scope of implementation score is that it takes into account the fact that innovations in organizations do not all have the same characteristics. Some affect large numbers of people in relatively small

ways, while others may have an enormous impact upon a relatively few number of people. Because change is not a unidimensional variable, an attempt was made to develop a differentiated approach to two basic questions about change: "how much" (the quantity of change) and "how different" (the quality of change).

Data regarding the scope of implementation of change were collected through a structured questionnaire that was completed by a professional anthropologist or sociologist who resided at each site. District and school administrators were consulted in the process of filling out the forms in order to ensure that the data reflected school personnel's judgments about the levels of implementation as well.*

Three measures were computed representing the quantity, quality and the total scope of implementation.** The variables, their operational definitions and Chronbach's Alpha coefficient of internal reliability are presented in Figure 2.

Defining indicators of linkage

The emerging literature on system linkage or coupling is notable for its lack of attention to operational definitions of linkage.*** In this paper, we will attempt to define only a limited set of such indicators. (For a broader treatment of this topic, see Rosenblum and Louis, 1978.)

Linkage within schools refers primarily to the interelatedness of behavior patterns between individuals. Coupling may be produced through

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*Very few discrepancies between the field workers and administrators were reported, and those discrepancies were relatively minor. Where a discrepancy in judgments arose, the judgments of the field worker were used after discussions about the nature of the discrepancy. In all cases discrepancy consisted of administrators rating the level of change on a given question slightly higher than did the field worker. The discrepancy in almost all cases consisted of a one-point separation on a six-point scale. A more detailed discussion of these measures may be found in Rosenblum and Louis (1971).

**Total scope is the sum of quantity and quality

***An exception to this generalization is Weick's (1976) listing of a range of phenomena that could be defined as evidence of loose coupling.

Figure 2

Scope of Implementation Variables

Variable	Operational Definition	Chronbach's Alpha Coefficient of Internal Reliability
Quantity	Sum of: % of students involved % of teachers involved average involvement of students (% of school day) average involvement of teachers (% of school day)	.60
Quality	Sum of five indicators reflecting degree of change (scaled 0-5 each) in -use of time, space and facilities -level of community involvement -administration and governance -curriculum -school structure	.76
Total Scope	Sum of quality and quantity normed to 100	.76

a variety of mechanisms, which are of two general types: structural linkages, or mechanisms which emphasize the formal means by which coordination of behavior is produced; and cultural or normative linkages, or mechanisms which emphasize the creation or coordination of similar behavior patterns through the development of shared definitions. Among the structure and culture measures discussed above are six which we identify as indicators of the degree to which the schools show traits suggestive of linkage.

Measures of Structural Linkage. Among the structure measures that may be considered indicators of system linkage are those dealing with the authority structure (among which we have selected superintendent authority, principal authority, and teacher autonomy) and the level of formalization. The authority structure variables are assumed to be related to system linkage through the degree to which they increase or decrease the coordination between units of a school or district. Where potential administrator influence over decisions is high, we assume that coordination will be higher. Where teacher autonomy within the classroom is high, on the other hand, we assume that coordination between units, both directly at the school level and secondarily between schools, will be more uncertain.

Formalization is an important measure of system linkage because the making and enforcing of rules is one of the major ways in which bureaucratic organizations ensure that there will be some standard operating procedures to govern behavior across units. In our measure of formalization we have taken account of the fact that many schools are "mock bureaucracies" (Gouldner, 1959) that have many rules, few of which are enforced, and thus we measured not only rules, but enforced rules.

Measures of Cultural Linkage. Cultural linkage measures the degree to which the climate of the organization reflects interaction between individuals. We assume that the greater the amount of work-related contact among individuals, the greater the cultural linkage. While we had available to us no direct measures of contact, two culture of our variables seem to be good proxies for culture linkage. The first is collegiality, which is composed of measures indicating the peer supportiveness of the staff. The second is the level of disputes, which we interpret as a positive indicator of linkage since the level and frequency of disputes between units that do not interact with one another is likely to be low. The fact that collegiality

and level of disputes are negatively correlated (r = -.51) does not undermine this argument, for we assume, like Weick (1976) that it is not necessary for all indicators of linkage to be consistent, nor is it likely that all possible arenas of "tight coupling" will occur simultaneously. In fact, it is possible that increased communication between role partners within a school may lead to either increased collegiality or increased conflict, depending on such other variables as the nature of the systems and/or the issues involved.

Determining the Existence of Change

In a discussion of system change, two different aspects of the concept of change must be identified. The first of these is concerned with identifying and measuring the location and direction of change (increase, decrease, or no change) on various dimensions of system characteristics, such as those that we have included under the general headings of input, structure and culture. For example, the amount of influence wielded by teachers over various decisions that are typically made in school systems may increase, decrease, or remain stable.

In addition, a second aspect of change relates to the notion of system turbulence, or the level of disruption in the system over a large group of system characteristics regardless of the direction of change of any particular variable. Organizational systems are often believed to exhibit a homeostatic tendency--they resist change, or tend to bound back when disturbed in an effort to preserve the character of the system (Katz and Kahn, 1966). The more isolated the changes in the system, the more likely it is that the homeostatic tendency will absorb or nullify these alterations, pulling the system back to its original state. Thus, in examining system change, it is important to locate the degree of alteration over the system in order to predict that system change will actually persist in the future.

In each case, change was measured by comparing school scores on variables as measured in 1973 with those obtained from the same schools in 1977. It is important to point out that these comparisons were made in a panel study of organizations, and not of individual respondants. Because of the high level of turnover in the schools and school districts under study, and the fact that the 1973 questionnaire was anonymous, it is not

possible to determine the degree to which changes in respondents in the schools are associated with measured changes in system characteristics. Our analysis has proceeded under the assumption that changes in the individual respondents in a given school or district is a source of measurement error that will cause any results of our analysis to underestimate the degree of systematic patterning within the data. Based upon our knowledge of the ten districts and their schools, we believe that there is no reason to assume that the aggregation of responses from individuals in 1977 who are different from those questioned in 1973 introduces any systematic bias into the data.

Results

Patterns of Change Among System Characteristics

Our first analysis investigated whether or not the schools showed change in system characteristics over the period of RS program implementation. The 1973 school-level means were compared with the corresponding means in 1977 to generate a series of change scores. If the change score was greater than half the pooled standard deviation of the school means on 1973-1977 change scores, the change was defined as substantively significant. Using this criterion many schools exhibited changes from 1973-1977 on any given indicator. There was also considerable variation among schools in the level of disruption or turbulence--i.e., the number of structure, culture, and staff variables on which they changed. Tables showing school change data and a discussion of change scores may be found in Appendix 1.

We then proceeded to examine the hypothesis that there would be no patterned association between change in one system part and change in another. Using the three-category indicators of change in school structure, culture, and input variables, a matrix of Kendall's Tau b was computed (see Table 1). The tau matrix indicates that 52 of 231 possible correlation coefficients reach a significance level of .10, while only 27 are significant at the .05 level or better. Using the conservative Bonferri test (Neter and Wasserman, 1974) this finding indicates that we fail to reject the hypothesis that there is no pattern. However, following the exploratory approach espoused by Tukey (1977) a visual examination of the matrix indicated some underlying patterns among some of the larger correlations which appeared to warrant further statistical treatment.

To identify patterns of change, the matrix was subjected to a cluster analyses designed to identify sets of variables which changed together Three recognizable clusters appear in Figure 3:

1) Intra-school linkage, consisting of variables representing change in collegiality, classroom autonomy, principals' influence, and teachers' influence.

2) An external control staff cluster, made up of variables representing change in staff educational attainment, percent males on staff, number of booksread, school board influence, and superintendent influence.

3) A school culture staff cluster, representing changes in frequency of disputes, tension, goal discrepancy, staff modernity, staff teaching experience, and individualized instruction.

Table 1

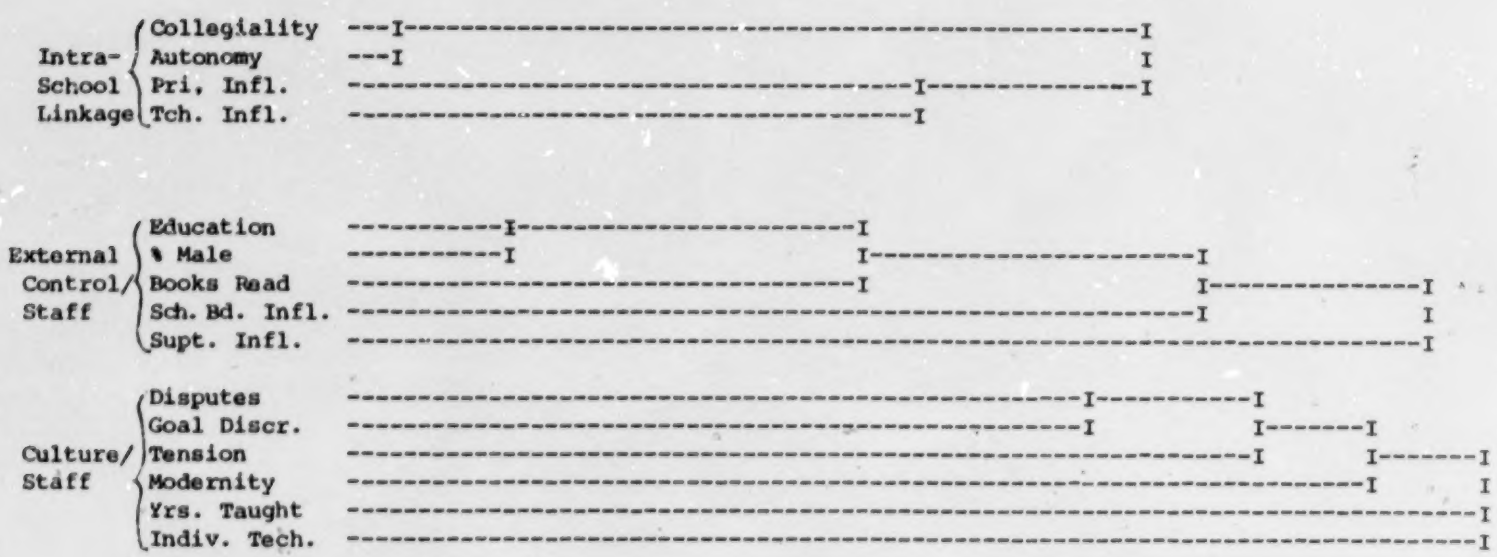
Measures of Association (Kendall's Tau_b) Among Indicators of Change in Structure, Culture, and Input (N = 45)

	Formalization	Individualized Technology	School Board Influence	Principal Influence	Superintendent Influence	Teacher Influence	Classroom Autonomy	Collegiality	Tension	Pupil Autonomy	Change Orientation	Morale	Disputes	Problems	Goal Differentiation	Goal Discrepancy	Educational Level	Father Education	Modernity	Percent Male	Professional Reading	Teaching Experience
Formalization	-	.10	.04	-.29**	.02	.07	-.15	-.19*	.17	.12	.19*	.21*	-.23*	.03	.06	-.03	-.02	-.20*	.22*	.05	.02	.04
Individualized Technology		-	-.12	.10	-.06	.11	.08	.12	.20*	.13	.04	-.22*	.15	-.13	-.04	-.02	-.04	-.02	.08	.00	-.24**	-.04
School Board Influence			-	.10	.11	.17	-.04	.07	.24**	.24**	.14	.17	-.08	-.21*	.09	.03	-.18*	-.30**	.02	-.26**	.30**	-.12
Principal Influence				-	-.04	.35**	.09	.30**	-.15	-.07	-.16	.15	.00	-.04	-.04	.02	.00	.31**	.16	.10	.39**	-.11
Superintendent Influence					-	-.08	.04	-.04	.02	.04	-.00	-.12	-.12	.15	.00	.10	.07	-.16	-.04	.00	.01	.01
Teacher Influence						-	.14	.33**	-.11	.19*	.04	.25**	-.15	.05	-.11	-.01	.03	.15	-.31**	.00	.13*	-.16
Classroom Autonomy							-	.35**	.08	.07	-.12	.07	.08	.15	.11	.00	-.10	.11	-.12	-.20*	.26**	.22
Collegiality								-	-.13	.20*	.04	.17	-.09	-.06	-.11	-.19*	-.01	.04	-.24**	-.04	.18*	.08
Tension									-	-.01	.13*	-.18	.01	.00	.08	.11	.00	.05	.27	.17	-.15	.19*
Pupil Autonomy										-	.14	-.19*	-.33**	-.24**	-.15	.00	.01	-.08	-.18*	.03	-.09	-.11
Change Orientation											-	-.12	-.22*	-.01	-.09	-.07	.09	-.12	.07	-.13	-.12	.06
Morale												-	-	-.04	.24**	-.24**	-.22*	-.08	-.01	.01	.29**	.05
Disputes														-.06	-.09	.11	.04	-.16	.14	-.07	-.17	-.12
Problems														-	.04	.26**	-.10	.11	-.25**	.02	.04	-.12
Goal Differentiation															-	-.03	.03	.13	.14	.14	.13	.21*
Goal Discrepancy																-	-.19*	.05	-.11	-.06	-.12	-.02
Educational Level																	-	-	-.03	.41**	-.26**	.13
Fathers Education																			.06	.01	.18*	-.22*
Staff Modernity																			-	-.15	.16	-.03
Percent Male Professional																				-	-.41**	-.05
Reading																					-	-.02
Teaching Experience																						-

* p ≤ .10
** p ≤ .05

Figure 3

Tree Diagram Illustrating Clusters of Change Indicators



Some important, though speculative, conclusions may be drawn out about the nature of linkages in schools from these results. First, some selectivity must be applied when applying the concept of "loose linkage". While there is no evidence to suggest that changes in one system part reverberate throughout the system, patterns of association among some parts are apparent.

The first cluster to emerge from the cluster analysis was a grouping of school level structural and cultural linkage change variables. However, the absence of a cluster of authority structure/centralization indicators, tying changes in school board, superintendent, principal, and teacher influence together is noteworthy. Rather, the variables representing changes in superintendent and school board influence cluster with changes in staff characteristics.

We see that variables which reflect the nature of linkages within the school itself--particularly linkages that are related to the patterning of decision-making and authority, and the interaction between staff members--tend to change together. As schools change, they often become more internally interdependent, with both teachers and principals taking greater responsibility for decision-making. This increase in influence is accompanied, apparently, by an increased specialization in the decision-making function (increased classroom autonomy coupled with increased principal authority in general) but also increased mutual supportiveness (collegiality). Conversely, if the system tends to decline in internal linkage, all of the variables that we have associated with linkage within schools tend to decrease together.

Some caveats to the notion that schools may be showing system linkage properties must also be emphasized, however, First, there is little evidence in the Tau matrix (Table 1) or the results of the cluster analysis (Figure 3) to suggest that culture and structure tend to change together. While one "culture" variable appears in the otherwise predominantly structure cluster that we have called "intra-school linkage" the predominant pattern is for culture and structural changes to occur independently of each other. However, this is not to argue that they are

independent of other school characteristics, as shown in the way they joined clusters with input variables.

Second, the data also show some support for the speculative discussion presented by Deal, Meyer and Scott (1975) to explain their lack of findings indicative of a relationship between district variables and school outcomes. Our data suggest that, while an identifiable cluster of intra-school linkage variables emerged, no district level linkage variables are attached to this cluster. Thus, while intra-school linkage variables tend to change together, such as when the school increases its internal coordination, this apparently occurs independently of changes at the district level. Thus, our results support Bidwell's (1965) assertion that in the structure of American education, the identification of linkage across levels is particularly problematic.

Third, it is particularly interesting to examine some of the additional variables that did not appear to change concomitantly with other variables, for they lead to some additional conclusions about ways in which school systems (and other organizations) may be loosely linked. First, it is notable that formalization is not associated either with district level structure variables, or with intra-school structure variables. Since administrative and bureaucratic theories emphasize formalization as a primary means of ensuring coordination, one is led to question the degree to which there are alternative mechanisms other than rules which may achieve the same ends in schools. If we examine the Tau Matrix (Table 11 it seems that one of the associations that may be occurring is the use of rules (formalization) as mechanisms to resolve disputes ($t = -.23$)--in other words, rules in the school system may operate more as a mechanism for dealing with conflict than for ensuring coordination.

Program Implementation and System Change

Our second hypothesis was that there would be negative relationship between change in organizational characteristics and measures of program implementation. This was based on the assumption that program change disrupts the system, a disruption the system tends to resist. To investigate this hypothesis, schools were grouped into three categories according to the direction of change--i.e., increase, no change, or decrease--on system characteristics from 1973 to 1977. For each resulting group, analysis of variance was used to compare group means on the three implementation

measures--quality, quantity, and total--discussed above. The results of these analyses are presented in Table

Using a $\leq .10$ as the criterion for statistical significance, it was found that five out of a possible 21 system change indicators were significantly related to project implementation. In these cases, the relationships indicate that in general, implementation scores were greatest among schools which did not change on these system characteristics.

More specifically, schools which did not show a change in collegiality had mean quality of implementation scores higher than those that increased or decreased. A similar pattern was observed in the mean total implementation scores for schools which did not change on the collegiality dimension.

Similarly, schools in which staff characteristics changes, in regard to modernity and percent male, showed significantly lower mean quality, quantity and total implementation scores than did the schools whose staff characteristics did not change. This suggests that altering the demographic composition of the staff may also impede implementation of innovative programs.

Referring back to Table 1 , we see that changes in modernity were significantly negatively related to changes in teacher influence and collegiality, and showed non-significant positive relations with tension and frequency of disputes. This suggests that the more cosmopolitan, newer staff may disrupt intra-level linkage with deleterious effect on implementation.

The analysis also suggests that changes in superintendent influence are significantly related to quality of implementation. Quality of implementation was highest among schools showing a decrease in superintendent influence, followed by schools not showing a change in superintendent influence. The lowest mean quality of implementation score was shown by schools where the superintendents' influence increased, suggesting a need for decentralized authority (reduced linkage) between district and school levels) if successful school level implementation is to occur.

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*For simplicity, cell sizes are not presented in Table 2 but may be obtained from Table A-1 of the Appendix.

Table 2

Means on Implementation Measures for Schools Showing Various Change Patterns*

Variables	Quality				Quantity				Total			
	Decrease	No Change	Increase	α	Decrease	No Change	Increase	α	Decrease	No Change	Increase	α
Collegiality	40.1	39.0	27.6	.07		N.S.			82.7	99.1	93.4	.10
Superintendent Influence	41.6	33.5	27.1	.06		N.S.				N.S.		
Education	37.5	34.4	9.0	.0005	61.4	54.6	24.8	.004	98.9	89.0	33.7	.0004
Maternity		N.S.			47.7	60.9	40.6	.03	77.9	97.5	65.9	.03
% Male	34.4	35.8	17.5	.01	39.9	57.9	41.8	.10	74.3	93.7	59.3	.03

*Only results significant at or beyond the .10 level are presented.

Turning to additional indicators of change in staff characteristics, we find that highest mean quality, quantity and total implementation scores went to schools where the educational level of the staff decreased or remained stable. Where staff educational background increased, implementation suffered. This may be partially due to a decline in morale if more highly educated staff were hired, as suggested by the significant negative correlation ($t = -.22$, $p \leq .10$) between change in morale and change in educational background of staff, although change in morale did not appear to be related to implementation by itself.

In summary, the outcome of these various analyses indicates that the degree of implementation at the school level is highest when collegial relations are strong and stable, when decision making is decentralized from the district superintendent, and when staff demographic composition is stable.

Further consideration of the need for structural stability leads almost inevitably to an examination of the relationship between total disruption or turbulence of the school system and implementation. Total dusruption of school systems was assessed by counting the number of variables which changed during the implementation period. Separate indicators were also computed for the changes in structure, culture and input variables and these along with the school climate improvement score was correlated with the three measures of implementation. The results presented in Table 3 showed statistically significant negative correlations between the number of changes in input (whether increases or decreases) and all three measures of implementation, and between the total number of changes and the quality and total dimensions. Number of changes in structure and culture were not significantly related to any measure of implementation.

These findings suggest that in small rural schools, avoidance of staff disruption is an important condition for high levels of program implementation. Indeed, the extent of turbulence in school structure and culture appears unrelated to measures of implementation, with the exception of disruption of collegial relations.

Table 3

Correlations Between Number of Changes in System Characteristics and Scope of Implementation

	Quality	Quantity	Total
# of staff changes	-.32**	-.21*	-.28**
# of culture changes	-.04	-.03	-.04
# of structure changes	-.15	-.03	-.09
Total # of changes (system turbulence)	-.25**	-.13	-.20*

*$p \leq .10$

**$p \leq .05$

Summary and Conclusions

To summarize our analyses of the patterns of system change and linkage at the school level, the structure and culture of schools appears to be subject to considerable change even over a relatively short period of time. Several distinctive patterns of change emerged which imply that change is not entirely a random process, but is in part conditioned by system characteristics. In particular, it appears that variables reflecting intraschool linkage (principal authority, teacher authority, classroom autonomy, and collegiality) tend to either increase or decrease together, and that several of the school culture variables (tension, disputes and goal discrepancy) also tend to increase or decline as a group. In addition, the data suggest that changes in structure do not tend to have a great impact on changes in culture, or vice versa, but that both structure and culture changes are linked to changes in various input characteristics.

The level of implementation is associated with change in a limited number of system linkage variables, primarily superintendent authority and collegiality, and with change in input variables. The data suggest that change or turbulence in the staff of the system is negatively related to implementation of comprehensive change. This indicates that it is possible to expect either alterations in the characteristics of the organizational system (for example, organizational development) or in the implementation of new programming or technological change, but that to attempt both types of change at the same time is perhaps unrealistic in the light of the system's need for some stability.

Overall, however, the data also show support for the view of the schools as loosely linked, and indicate that loose linkage has significant implications for the change process. In particular, the data suggest that there is little support for the notion that technological interventions will lead to beneficial changes in basic system characteristics. In fact, there is some reason to tentatively conclude that successful technological innovations cannot be accompanied by major changes in the structure, culture or staff characteristics of the system.

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APPENDIX I

It is of interest to note that the structure variables showing the greatest stability--i.e., variables with the greatest numbers of schools in the "no change" category--were those pertaining to centralization of power: superintendent influence and principals' influence, both of which are indicators of linkage between system levels. Indeed, none of the districts' ES projects had major components specifically oriented toward altering the administrative structure of the schools, and this was the component least affected by the program (see Rosenblum and Louis, 1978 for more detail). Formalization and classroom autonomy, indicators of linkage within the school, were also relatively stable. Since most of the local goals were stated in terms of improved student services and updating outmoded curricula, the stability of the power structure was never really the issue. Programmatically, the lack of emphasis on structure was quite reasonable.

The changes in staff variables are also noteworthy. Variables in this group which showed the most changes were years of teaching experience, educational level of staff, and staff modernity. On all of these characteristics, the changes tended to be decreases, implying that newer staff were less experienced, less well educated, and from schools in less cosmopolitan states--precisely the opposite of what we might expect schools committed to innovation to look for in newer staff. However, we know from our on-site researchers that many staff, including some innovative teachers, were put off by the disruption of ES projects implemented in their schools and the disruption these programs caused. As staff turnover took place, replacements were often recruited from among relatively conservative, local applicants, perhaps as a reaction against the disruption associated with the goals of the ES program.

Table A-1

Number of Schools Showing Changes in School Structure, Culture and Input Variables by Type of Change

	Increase	No Change	Decrease	Total Changes	Valid N*
Formalization	15	18	10	25	43
Individualization	8	14	21	29	43
School Board Influence	12	16	14	26	42
Superintendent Influence	12	20	10	22	42
Principal Influence	16	21	4	20	41
Teacher Influence	13	16	13	26	42
Classroom Autonomy	14	18	11	25	43
Collegiality	9	19	15	24	43
Morale	5	34	6	11	45
Orientation to Pupil Autonomy	9	11	23	31	43
Change Orientation	6	14	23	29	43
Tension	16	17	9	25	42
Disputes	10	21	11	21	42
Problems Index	5	11	29	34	45
Goal Differentiation	18	19	6	24	43
Goal Discrepancy	10	18	14	24	42
Education	4	24	17	21	45
Father's Education	6	31	8	14	45
Modernity	7	27	11	18	45
% Male	6	36	3	9	45
Books Read	6	30	9	15	45
Years Taught	1	22	22	23	45

*Numbers do not always sum to 45 due to missing data

Table A-2

Number of Changes in Structure, Culture, Input by School and District

District and School	Culture Change	Structure Change	staff Change	Total Changes
Salmon Point:				
School 1	6	5	4	15
School 2	3	5	4	12
Prairie Hills:				
School 3	5	4	1	10
School 4	3	3	3	11
School 5	4	4	4	12
School 6	7	4	0	11
Big Sky:				
School 8	5	4	4	13
School 9	7	5	3	15
School 11	*	3	1	*
School 13	7	3	1	11
School 14	6	5	3	13
School 15	5	7	4	16
School 16	8	6	5	19
School 17	8	5	*	17
School 18	7	6	1	14
Clayville:				
School 19	3	5	3	11
School 20	7	3	1	11
School 21	8	6	0	14
School 22	5	5	0	10
School 23	4	3	1	8
Butte-Angels Camp:				
School 25	3	6	3	12
School 26	4	6	1	11
School 27	4	3	2	9
School 28	8	5	2	15
School 31	3	3	1	7
Liberty Notch:				
School 32	4	3	4	11
School 33	5	3	1	8
School 34	5	4	1	10
School 35	*	0	5	*
Magnolia:				
School 36	7	3	2	12
School 37	4	6	1	11
School 38	*	0	4	*
School 39	5	6	4	15
School 40	6	6	3	15
School 41	5	6	4	15
Oyster Cove:				
School 43	5	7	5	17
School 44	4	4	2	9
Timber River:				
School 45	5	5	1	11
School 46	6	6	1	13
School 47	6	6	3	15
School 48	5	4	1	10
School 49	4	3	2	9
Desert Basin:				
School 50	1	5	0	6
School 51	5	5	1	11
School 52	5	3	0	8

*Cannot be tallied due to missing data.